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NOTICE OF THE ELECTRO-MAGNETIC MACHINE OF MR. THOMAS DAVENPORT, OF BRANDON, NEAR RUTLAND VERMONT.

Many years have passed since motion was first produced by galvanic power. The dry columns of De Luc and Zamboni caused the vibration of delicate pendulums and the ringing of small bells, for long periods of time, even several years without intermission.

In 1819–20, Prof. Oersted, of Copenhagen, discovered, that magnetism was evolved between the poles of a galvanic battery. Prof. Sweigger, of Halle, Germany, by his galvanic multiplier, succeeded in rendering the power manifest, when the galvanic battery was nothing more than two small wires, one of copper and the other of zinc, immersed in as much acidulated water as was contained in a wine glass. The power thus evolved was made to pass through many convolutions of insulated wire, and was thus augmented so as to deflect the magnetic needle sometimes even 90°. Prof. Moll, of Utretcht, by winding insulated wire around soft iron, imparted to it prodigious magnetic power, so that a horse shoe bar, thus provided, and connected with a galvanic battery, would lift over one hundred pounds. About the same time, Mr. Joseph Henry, of Albany, now Prof. Henry, of Princeton College, by a new method of winding the wire, obtained an almost incredible magnetic force, lifting six or seven hundred pounds, with a pint or two of liquid and a battery of corresponding size; nor did he desist, until, a short time after, he lifted thousands of pounds, by a battery of larger size, but still very small, (1830.)

This gentleman was not slow to apply his skill to the generation of motion, and a successful attempt of his is recorded in this Journal, Vol. xx. p. 340. A power was thus applied to the movement of a machine, by a beam suspended in the centre, which performed regular vibrations in the manner of a beam of a steam-engine. This is the original application from which have sprung, or at least to which have succeeded, several similar attempts, both in this country and in Europe. A galvanic machine was reported to the British Association in 1835, by Mr. McGauly, of Ireland, and he has renewed his statements of successful experiments at the late meeting at Bristol. Mr. Sturgeon, of Woolwich, England, also reports a galvanic machine as being in use on his premises for pumping water, and for other mechanical purposes.*

But, I believe that Mr. Davenport, named at the head of this notice, has been more successful than any other person in the discovery† of a galvanic machine of great simplicity and efficiency. During the last two or three years, much has been said of this discovery in the newspapers, and it is probable, that in a future number of this Journal, drawings, and an accurate description of the machine may be given. Having been recently invited to examine a working model, in two varieties of form, and to report the result, I shall now attempt nothing more than a general description, such as may render intelligible the account I am to give.

1. *The Rotary Machine, composed of revolving electro-magnets, with fixed permanent magnets.*

This machine was brought to New-Haven March 16, 1837, by Mr. Israel Slade, of Troy, N. Y., and by him set in motion for my examination. The moving part is composed of two iron bars placed horizontally, and crossing each other at right an-

* Sturgeon's Annals of Electricity, Magnetism, &c. No. 1. Vol. 1. October, 1836.

† Mr. Davenport appears to have been strictly the inventor of a method of applying galvanism to produce rotary motion.

gles. They are both five and a half inches long, and they are terminated at each end by a segment of a circle made of soft iron; these segments are each three incher long in the chord line, and their position, as they are suspended upon the ends of the iron bars, is horizontal.

The iron cross is sustained by a vertical axis, standing with its pivot in a socket, and admitting of easy rotation. The iron cross bars are wound with copper wire, covered by cotton, and they are made to form, at pleasure, a proper connexion with a small circular battery, made of concentric cylinders of copper and zinc, which can be immersed in a quart of acidulated water. Two semicircles of strongly magnetized steel form an entire circle, interrupted only at the two opposite poles, and within this circle, which lies horizontally, the galvanized iron cross moves in such a manner that its iron segments revolve parallel and very near to the magnetic circle, and in the same plane. Its axis at its upper end, is fitted by a horizontal cog-wheel to another and larger vertical wheel, to whose horizontal axis, weight is attached and raised by the winding of a rope. As soon as the small battery, destined to generate the power, is properly connected with the machine, and duly excited by diluted acid, the motion begins, by the horizontal movement of the iron cross, with its circular segments of flangers. By the galvanic connection, these crosses and their connected segments are magnetized, acquiring north and south polarity at their opposite ends, and being thus subjected to the attracting and repelling force of the circular fixed magnets, a rapid horizontal movement is produced, at the rate of two hundred to three hundred revolutions in a minute, when the small battery was used, and over six hundred with a calorimotor of large size. The rope was wound up with a weight of fourteen pounds attached, and twenty-eight pounds were lifted from the floor. The movement is instantly stopped by breaking the connexion with the battery, and then reversed by simply interchanging the connexion of the wires of the battery with those of the machine, when it becomes equally rapid in the opposite direction.

The machine, as a philosophical instrument, operates with beautiful and surprising effect, and no reason can be discovered why the motion may not be indefinitely continued. It is easy to cause a very gradual flow of the impaired or exhausted acid liquid from, and of fresh acidulated water into, the receptacle of the battery, and whenever the metal of the latter is too much corroded to be any longer efficient, another battery may be instantly substituted, and that even before the connexion of the old battery is broken. As to the energy of the power, it becomes at once a most interesting inquiry, whether it admits of indefinite increase? To this inquiry it may be replied, that provided the magnetism of both the revolving cross and of the fixed circle can be indefinitely increased, then no reason appears why the energy of the power cannot also be indefinitely increased. Now, as magnets of the common kind, usually called permanent magnets, find their limits within, at most, the power of lifting a few hundred pounds, it is obvious that the revolving galvanic magnet must, in its efficiency, be limited, by its relation to the fixed magnet. But it is an important fact, discovered by experience, that the latter is soon impaired in its power by the influence of the revolving galvanic magnet, which is easily made to surpass it in energy, and thus, as it were, to overpower it. It is obvious, therefore, that the fixed magnet, as well as the revolving, ought to be magnetized by galvanism, and then there is every reason to believe that the relative equality of the two, and of course their relative energy, may be permanently supported, and even carried to an extent much greater than has been hitherto attained.

2. *Rotating Machine, composed entirely of electro-magnets, both in its fixed and revolving members.*

A machine of this construction has been, this day, March 29, 1837, exhibited to me by Mr. Thomas Davenport himself, who came from New-York to New-Haven for that purpose.

It is the same machine that has been already described, except that the exterior fixed circle is now composed entirely of electro-magnets.

The entire apparatus is therefore constructed of soft unmagnetic iron, which being properly wound with insulated copper wire, is magnetized in an instant, by the power of a very small battery.

The machine is indeed the identical one used before, except that the exterior circle

of permanent magnets is removed and in its place is arranged a circle of soft iron, divided into two portions to form the poles.

These semicircles are made of hoop iron, one inch in width, and one-eighth of an inch in thichness. They are wound with copper wire insulated by cotton—covering about ten inches in length on each semicircle and returning upon itself, by a double winding, so as to form two layers of wire, making on both semicircles about one thousand five hundred inches.

The iron was not wound over the entire length, of one of the steel semicircles; but both ends were left projecting, and being tuined inward, were made to conform to the bend of the other part, as in the annexed figure, which is intended to represent one of

them; each end that is turned inward and not wound is about one-third of the length of the semicircle. These semicircles being thus fitted up, so as to become, at pleasure, galvanic magnets, were placed in the same machine that has been already described, and occupied the same place that the permanent steel magnets did before. The conducting wires were so arranged, that the same current that charged the magnets of the motive wheel, charged the stationary ones, placed around it, only one battery being used. It should be observed, that the stationary galvanic magnets thus substituted for the permanent steel ones, were only about half the weight of the steel magnets. This modification of the galvanic magnet, is not of course the best form for efficiency; this was used merely to try the principle, and this construction may be superseded by a different and more efficient one. But with this arrangement, and notwithstanding the imperfection of the mechanism of the machine—when the battery, requiring about one quart of diluted acid to immerse it, was attached, it lifted 16 lbs., very rapidly, and when the weight was removed, it performed more than 600 evolutions per minute.

So sensible was the machine to the magnetic power, that the immersion of the battery one inch into the acidulated water, was sufficient to give it rapid motion, which attained its maximum, when the battery was entirely immersed. It appeared to me that the machine had more energy with the electro-magnets, than with those that were permanent, for with the smallest battery, whose diameter was three inches and a half; its height five inches and a half, and the number of concentric cylinders three of copper and three of zinc, the instrument manifested as great power as it had done with the largest batteries, and even with a large calorimotor, when it was used with a permanent instead of a galvanic magnet. With the small battery and with none but electro or galvanic magnets, it revolved with so much energy as to produce a brisk breeze, and powerfully to shake a large table on which the apparatus stood.

Although the magnetization of both the stationary and revolving magnets was imparted by one and the same battery, the magnetic power was not immediately destroyed by breaking the connexion between the battery and the stationary magnet; for, when this was done, the machine still performed its revolutions with great, although diminished energy; in practice this might be important, as it would give time to make changes in the apparatus, without stopping the movement of the machine.

It has been stated by Dr. Ritchie, in a late number* of the London and Edinb. Phil. Magazine, that electro-magnets do not attract at so great a distance as permanent ones, and therefore are not well adapted for producing motion. On this point Mr. Davenport made the following experiment, of which I was not a witness, but to which I give full credit, as it was reported to me by Mr. Slade, in a letter dated New-York, March 24, 1837.

Mr. Davenport suspended a piece of soft iron with a long piece of twine and brought one pole of a highly charged steel magnet within the attracting distance, that is, the distance at which the iron was attracted to the magnet; by measurement, it was found that the steel magnet attracted the iron one inch and one-fourth. A galvanic magnet was next used of the same lifting power, and consequently of much less weight; the attracting distance of this magnet was found to be one inch and three-fourths, showing a material gain in favor of the galvanic magnet.—Mr. Slade inquires, "has Mr. Ritchie's magnet been so constructed as to give a favorable

* January, 1837.

trial to this principle ?"* Mr. Davenport informs me that each increase in the number of wires has been attended with an increase of power.

Conclusions.

1. It appears then, from the facts stated above, thal electro-magnetism is quite adequate to the generation of rotary motion.

2. That it is not necessary to employ permanent magnets in any part of the construction, and that electro-magnets are far preferable, not only for the moving but for the stationary parts of the machine.

3. That the power generated by electro-magnetism may be indefinitely prolonged, since, for exhausted acids, and corroded metals, fresh acids and batteries, kept always in readiness, may be substituted, even without stopping tbe movement.

4. That the power may be increased beyond any limit hitherto attained, and probably beyond any which can be *with certainty* assigned,—since, by increasing all the members of the apparatus, due reference being had to the relative proportionate weight, size, and form of the fixed and moveable parts—to the length of the insulated wires and the manner of winding them—and to the proper size and construction of the battery, as well as to the nature and strength of the acid or other exciting agent, and the manner of connecting the battery with the machine, it would appear certain, that the power must be increased in some ratio which experience must ascertain.

5. As electro-magnetism has been experimentally proved to be sufficient to raise and sustain several thousands of pounds, no reason can be discovered why, when the acting surfaces are, by skillful mechanism, brought as near as possible, without contact, the continued exertion of the power should not generate a continued rotary movement, of a degree of energy inferior indeed to that exerted in actual contact, but still nearly approximating to it.

6. As the power can be generated cheaply and certainly—as it can be continued indefinitely, as it has been very greatly increased by very simple means—as we have no knowledge of its limit, and may therefore presume on an indefinite augmentation of its energy, it is much to be desired, that the investigatton should be prosecuted with zeal, ***aided by*** *correct scientific knowledge*, by *mechanical skill*, and by *ample funds*. It may therefore be reasonably hoped, that science and art, the handmaids of discovery, will both receive from this interesting research, a liberal reward.

Science has thus, most unexpectedly, placed in our hands a new power of great but unknown energy.

It does not evoke the winds from their caverns ; nor give wings to water by the urgency of heat ; nor drive to exhaustion the muscular power of animals ; nor operate by complicated mechanism ; nor accumulate hydraulic force by damming the vexed torrents ; nor summon any other form of gravitating force ; but, by the simplest means—the mere contact of metallic surfaces of small extent, with feeble chemical agents, a power every where diffused through nature, but generally concealed from our senses, is mysteriously evolved, and by circulation in insulated wires, it is still more mysteriously augmented, a thousand and a thousand fold, until it breaks forth with incredible energy ! there is no appreciable interval between its first evolution and its full maturity, and the infant starts up a giant.

Nothing since the discovery of gravitation and of the structure of the celestial systems, is so wonderful as the power evolved by galvanism ; whether we contemplate it in the muscular convulsions of animals, the chemical decompositions, the solar brightness of the galvanic light, the dissipating consuming heat, and, more than all, in the magnetic energy, which leaves far behind all previous artificial accumulations of this power, and reveals, as there is full reason to believe, the grand secret of terrestrial magnetism itself.

B. S.

New-Haven, March 31, 1837.

Cla.m of Thomas Davenport.

In the words of the patent, taken out, this invention " consists in applying magnetic and electro-magnetic power as a moving principle for machinery, in the manner described, or in any other substantially the same in principle."

" Mr. Davenport first saw a galvanic magnet in December, 1833, and from the wonderful effects produced by suspending a

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* This question I am not able to answer, as I have not seen any account of the apparatus or of the experiment, but only of the result.

magnet of 150 lbs. from a small galvanic battery, he immediately inferred, without any knowledge of the theory or the experiments of others, that he could propel machinery by galvanic magnetism. He purchased the magnet and produced his first rotary motion in July, 1834. In July, 1835, he submitted his machine to Prof. Henry, of Princeton, New-Jersey, also without any knowledge of Prof. Henry's experiments in producing a vibratory motion. From this gentleman he received a certificate, testifying to the originality and importance of the invention."

Mr. Davenport is, by occupation, a blacksmith, with only a common education, but with uncommon intelligence; his age about thirty-five. Mr. Ransom Cook, of Saratoga Springs, is associated with Mr. Davenport, and has rendered essential service by the improvements he has made in the machine, and by his assistance in bringing the subject before the public in the most effectual way. Arrangements have been made to take out the patent in Europe.

P. S. The proprietors are constructing a machine of seven inches in diameter, and also one of two feet in diameter. Galvanic magnets will be used as the moving and stationary magnets of each.

From the Scientific and Literary Journal.

PRECIOUS STONES.

Gems, or precious stones, as they are frequently called, are for the most part transparent, and have a vitreous or glassy appearance. Their different colors are occasioned by metallic oxydes of various kinds with which they are impregnated, Some writers have classed them by their colors, but this is a very uncertain mode, since different gems have not unfrequently the same color, and in many cases, the same gems are of different colors. The usual distinction of gems into oriental and occidental is also liable to error, since the best gems, from whatever part of the world they are brought, are always called oriental. The most estimable of all the species are the diamond, ruby, emerald, and sapphire. The amethyst, topaz, and aqua marine are considered of nearly equal value with each other; and the garnet is the cheapest of precious stones.

The ancients engraved upon several kinds of gems, but they appear to have been ignorant of the art of cutting the diamond, the ruby, and the sapphire, which were too hard for them to operate upon. The emerald and the opal were too highly esteemed as precious stones to have often found their way into the hands of engravers. The garnet was often engraved upon, and there are many master-pieces of the art in chalcedony and cornelian. Onyx and sardonyx were employed for that species of engraving in relief called cameos; and in many instances, it is pleasing to observe with what dexterity the ancient artists availed themselves of the different colors in the alternate zones to express the different parts and shades of their figures.

DIAMONDS.

The diamond, or adamant of the ancients, which, by universal consent, has been placed at the head of the mineral kingdom, is the hardest of all bodies, and, when pure, is perfectly transparent, like crystal, but infinitely more brilliant.

The best are brought from the East Indies; and the principal mines are those of Raolconda and Coulour, in the province of Golconda; and that of Soumelpour, or Goual, in Bengal. At Raolconda they are found in deep crevices of the rocks. Persons, by means of long iron rods, with hooks at the ends, draw out from these crevices the loose contents, and afterwards wash them in tubs, for the purpose of discovering the diamond.

As soon as all the earthy particles have been washed away, the gravel-like matter that remains is raked together, the stones are thrown out, and what diamonds happen to be present are found among the refuse that is left.

In order to ascertain whether a stone which has been found be really a diamond, the workmen have a mode of placing it upon a hard substance, and striking it with a hammer. If it resist the blow, or seperate into leaves, it must be a diamond; but, in the latter case, the discovery is made at an immense expense, since by thus diminishing the size, its value must also, of course, be greatly diminished.

When the diamond is rubbed, it will attract bits of straw, feathers, hairs, and other small objects; and if exposed to the rays of the sun, and immediately taken into a dark place, will appear luminous.

CHRYSOLITE.

Chrysolite is the softest of all the gems, and usually of yellowish green color, though sometimes it is grass green, or bluish green, but with a tinge cf brown.

Though scarcely harder than glass, and consequently inferior to most other gems in lustre, these stones are not unfrequently used in jewelry, particularly for necklaces and ornaments for the hair ; and when well matched in color, and properly polished, their effect is very good. They are, however, too soft for ring stones.

This stone is imported from the Levant, and is said to be found in Upper Egypt.

GARNET.

This stone is found abundantly in many mountains of different parts of the world. But those of the hardest and best quality are brought from Bohemia, where there are regular mines of garnets; and a great number of persons are there employed in collecting, cutting and boring them. The boring is performed by means of an instrument, having a diamond at its extremity, which is rapidly turned by a bow.

Garnets vary much in size, some of them being upwards of an inch in diameter, and others not larger than a pin's head. Generally speaking, they are stones of inferior value.

In comparison with the ruby, those even of finest quality have a very sombre appearance. The kinds most esteemed are such as have a clear and intense red color, or a rich violet or purplish tinge. The latter are called *Syrian garnets*, not from the country of that name, as is usually supposed, but from the word *soranus* which signifies a *red stone*,

The best garnets are cut, in the manner of other precious stones, and set upon a foil of the same color ; but some are cut into beads, and strung for necklaces.

SAPPHIRE.

The oriental sapphire is a gem of blue color, the shades of which vary, from a full and deep tint to a nearly colorless appearance.

We are chiefly indebted for the sapphire to the East Indies and the island of Ceylon, where it is found among the sand of the rivers.

In hardness the sapphire ranks next to the ruby, and in value it is about equal to the emerald. In the Museum of Natural History at Paris, there is a sapphire which weighs upwards of sixty-six carats, and which was placed there from the wardrobe of the crown.

It is said that sapphires lose their color in the fire, and that, after having been subjected to heat, they are so hard and transparent as sometimes to be sold for diamonds.

RUBY.

Oriental ruby is a precious stone of very intense and bright red color, occasionally varied with blue, and sometimes partically colored.

The ruby is imported into this country from the East Indies, though seldom in a rough state, since the stones are almost always first cut by the Indians for the purpose of ascertaining their value. They are said to be found in the sand of certain streams near the town of Sirian, the capital of Pegu ; and with sapphires in the sand of the rivers of Ceylon.

The hardness of this stone is such that the ancients do not appear to have possessed the art of cutting it ; and in the improvements which have of late been made in the construction of time-keepers, no stones have been found sufficiently hard for jewelling the holes, except the ruby and the diamond.

AMETHYST.

The amethyst was a gem well known to the ancient Greeks and Romans, and held by them in great esteem. Its name is derived from the Greek language, and implies a power of preventing intoxication, which, originating no doubt in the resemblance of its color to that of wine, and the absurd doctrine of sympathies, it was believed by the ancients to possess. They ascribe to it many other virtues equally surprising and equally absurd, particularly that the wearing of it would expel melancholy, procure the confidence and friendship of princes, render people happy, and even dispel storms of wind and hail. The ancients frequently engraved upon the amethyst ; and their favorite subject was the representation of Bacchus and his followers.

Persons accustomed to make imitations

of the precious stones find the amethist one of the easiest to be counterfeited.

TOPAZ.

The topaz is a gem usually of a wine yellow color, but sometimes orange, pink, blue, and even colorless like rock crystal.

The word topaz is derived from an island in the Red Sea, where the ancients found a stone, but very different from ours, which they denominated topaz. The best, are of deep color, which are imported from Brazil; and the most brilliant are supposed to be those of Saxony ; but the latter are generally of very pale color. This species of gem is also found in Siberia and other countries. It is often defective in transparency, and sometimes even opaque.

It is a somewhat singular circumstance, that if the topaz of Saxony be gradually exposed to a strong heat in a crucible, it will become white ; and, on the contrary, that the Brazilian topazes by the same process become red or pink. The latter are not unfrequently sold, as natural stones of this color, by the name of *pink topazes* and *Brazilian rubies.*

The *blue topaz* is a rare Brazilian gem, which varies in size from one or two carats to two or three ounces. The *white topaz* is perfectly colorless. This stone, which generally occurs of small size, is in considerable estimation In Brazil. It is usually employed in circular ear-rings, or for the purpose of being set round yellow topazes.

From the Journal of the Franklin Institute.

A MODE OF ANALYSING GERMAN SILVER.

BY JAS. C. BOOTH.

As the employment of this interesting compound is daily becoming more general, it becomes a point of some importance to the manufacturer to ascertain with some accuracy the composition of those kinds in the market, which are adjudged to possess superior qualities. For this purpose I have contrived a method of analysing them, which may be successfully practised by any one who possesses a little chemical knowledge. A small piece of about 20 grains is dissolved in niro-muriatic acid with the assistance of a gentle heat, by which means the metals will be converted into chlorides. If the solution be filtered through a small paper-filter, and a white powder remain after washing with water, it is the chloride of silver, the presence of which metal in the compound is accidental and scarcely appreciable. The acidulated solution is then treated by sulphuretted hydrogen, which separates copper and a little arsenic. The sulphuret of copper is collected on a filter, treated with nitric acid in a gentle heat, till the sulphur appears whitish, then filtered, brought to boiling, precipitated with caustic potassa, filtered and weighed. 100 parts of this precipitate contains 79.83 of metallic copper. To the solution after filtering off the sulphuret of copper, a little nitric acid is added, and the whole heated in order to convert the protroxide into the peroxide of iron. Muriate of Ammonia is then added to the same and a small excess of ammonia, which precipitates only the peroxide of iron. This may be collected on a filter and weighed, 100 parts of it contain 69.34 of metallic iron. The solution is now to be treated with carbonate of soda and evaporated to dryness; the dry mass is treated with hot water, and the residue washed and dried. This powder, consisting of carbonic of zinc and nickel, is mixed with half its weight of saltpetre and ignited until the whole is nearly dry. It is transferred to a filter after being powdered in a small mortar, and is then washed two or three times with pure, but dilute, nitric acid, which dissolves the oxide of zinc, and leaves the *peroxide* of nickel. To the zinc solution carbonate of soda is added, the whole evaporated to dryness, treated with hot water, and the remainder after being dried and ignited is weighed, 100 parts contain 80.13 metallic zinc. The peroxide of nickel is dissolved in hydro-chloric acid, precipitated by caustic potassa, filtered off and weighed, 100 parts of it contain 78.71 metallic nickel.

The separation of nickel and zinc is ever attended with difficulty and some uncertainty, but it is rendered much more simple by the method which I propose, and which is not more inaccurate than others in use. Before weighing any of the above oxides, it is decidedly preferable to burn the filter after shaking off as much of the substance as possible into a platinum crucible, to add the ashes, and then substract their weight from that of the oxide.

TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

EXPERIMENTS OF THE RESISTANCE OF BARGES MOVING ON CANALS, BY HENRY R. PALMER, ESQ., V. P. INST. C. E. ADDRESSED TO THE LATE PRESIDENT, THOMAS TELFORD, ESQ.

The statements that have been laid before the public in reference to the swift passage of boats along the Ardrossan Canal, having occasioned a renewal of, and more extended inquiry into the subject of the resistance to which the motion o boats and barges is exposed, I think it important that every useful fact relating to it should be co lected and placed in the records of the Institution of Civil Engineers.

With this view I have transcribed the particulars of some experiments with which, through your kindness, I had the honor to be entrusted in the year 1824, when the comparison of the cost of conveyance by canals and railways constituted a popular question.

In the performance of the experiments referred to, I very soon perceived the difficulty of obtaining the results with that accuracy which was required.

The moving forces being animal power, one imperfection arose from the difficulty of preserving an equable motion. From the same cause I was unable to obtain, at will, any given velocity, so that the results might be obtained in the order required for a tabular registration. A third imperfection was occasioned by wind, which, however slight to the sensation, materially affected the results.

Considering, however, that the experiments were upon the large scale, that the circumstances affecting each are recorded, and that no assumptions were allowed to interfere, they are susceptible of some useful deductions, more especially when received, in comparative order, with facts which have been since and which may hereafter be obtained.

The purport of the experiments was entirely of a practical nature, and therefore they were tried by means strictly conformable with those actually in common use. The towing ropes were attached to the barges at the same parts as usual, the lengths of the ropes used were of the customary dimensions on each canal respectively, and the moving power exerted in the same position, viz., along the towing path on one side of the canal.

The results, therefore, do not exhibit precisely the resistances of the barges in a straight line, uninfluenced by the rudder, bu that resistance which the circumstances oblige the horse to overcome, which from the obliquity of the line of force with that of the mot on of the barge, gives an increased quantity in proportion. Although this error is of small magnitude, and will have little effect in the proportion of the results to each other, (which is an important feature in the experiments,) it may lead to incongruities in the comparison of these experiments with others determined by other means, if not attended to.

Method used for ascertaining the Resistances of the Barges moving on Canals.

A sheeve or pulley was suspended from the post to which the towing line is usually fastened, the towing line was then passed over that pulley, and the end of it fastened to the weights that were to indicate the resistance; the barge was then towed in the usual manner, and the weight being always insufficient at the commencement, it was raised up to the pulley, and was suffered to remain so, until the barge appeared to be in a regular and uniform motion. Additional weights were then suspended, until they fell to about 12 inches from the pulley, when they were so adjusted as to remain suspended there, their only motion being a slight vertical vibration, occasioned by the stepping of the men employed to draw the line.

A straight part of the canal was chosen, and the length through which an experiment was continued was divided into equal parts, each being marked by a stake. The equality of the motion was therefore ascertained by the time occupied in passing each division, so that when the divisions of the whole space had been passed in equal times, and the weights had during the whole time remained within the same limits of vibration, the experiment was considered as having been fairly made.

The experiments being made on different canals, it was always found necessary to practice the men in drawing the barges, before they were found to walk with sufficient regularity, and the loss of time thus engaged caused frequent regret that soldiers could not be obtained for the purpose.

One of the experiments (No. 17) given in the Table was furnished to me by Mr. Bevan, the engineer to the Grand Junction Canal Company. In the four last I was favored with the assistance of Professor Barlow, the late Mr. Chapman of Newcastle, Mr. B. Donkin, and Mr. Bevan.

No. Experiment.	Name of the Navigation.	Description of the Vessel.	Place of the Experiment.	Dimension of the Navigation.	Dimension of the Vessel	Draught of Vessel.	Space of the Experiment.	Time of the Experiment.	Velocity in Miles.	Resistance, or moving Force.	Load, or useful effect.	Whole effect.	Fraction of Force to the Load.	Ditto, including the Barge.	Number of the Horses, Men, &c.	OBSERVATIONS.
				Feet.	Ft. In.	Ft. In.	Chains.	Min'tes	Miles.	lbs.	Tons	Tons.				
1.	Mersey and Irwell.	Packet.	Near Runcorn.	48 wid 6 deep	62 9 long 13 9 wide	1 8 fr't 2 st'	79	12	4.9300	343	1.20	$43\frac{1}{2}$	$\frac{1}{73}$	. .	3	
2.	Do.	Kent flat.	From Barton to Meadwheel Lock.	River	64 10 14 6	4 1	165	48	2.5757	242	40	92	$\frac{1}{370}$	$\frac{1}{851}$	2	Vessels with masts and rigging. Surface exposed to wind much greater than that of ordinary canal barges.
3.	Do.	Haywodd flat.	Old Quay to Meadwheel Lock.	Do.	Do.	2 0	265	56	3.5378	140	empty.	52	. .	$\frac{1}{832}$	2	Canal irregular in depth. Wind at the time sensibly affected the experiments. Nos. 3 and 4 disturbed the water considerably.
4.	Do.	Do.	Meadwheel to Barton Lock.	Do.	Do.	2 0	165	33	3.7575	140	do.	52	. .	$\frac{1}{832}$	2	
5.	Ellesmere.	Small boat.	Near Ellesmere.	30 wide 6 deep	69 long 3 6 wide	2 5	36.8	6	4.6000	168	10	$14\frac{1}{2}$	$\frac{1}{133}$	$\frac{1}{193}$	Men.	The only errors observable in the experiments on the Ellesmere Canal were attributable entirely to the wind, the effect of which is seen in the results.
6.	Do.	Do.	Do.	Do.	Do.	Do.	30.27	$4\frac{5}{6}$	4.6900	170	10	$14\frac{1}{2}$	$\frac{1}{132}$	$\frac{1}{191}$	Do.	
7.	Do.	Do.	Do.	Do.	Do.	Do.	30.27	6′ 15″	3.6300	77	$10\frac{1}{2}$	15	$\frac{1}{305}$	$\frac{1}{436}$	Do.	
8.	Do.	Do.	Do.	Do.	Do.	Do.	39.27	7′ 40″	2.9600	50	$10\frac{1}{2}$	15	$\frac{1}{470}$	$\frac{1}{672}$	Do.	
9.	Do.	Common barge.	Do.	Do.	68 6 long 7 0 wide	1 8 fr't 2 7 st'n	30.27	15′ 30″	1.9000	50	21	30	$\frac{1}{940}$	$\frac{1}{1344}$	Do.	
10.	Do.	Do.	Do.	Do.	Do.	Do.	39.27	10′	2.9450	66	$10\frac{3}{4}$	$19\frac{3}{4}$	$\frac{1}{365}$	$\frac{1}{670}$	Do.	With the wind.
11.	Do.	Do.	Do.	Do.	Do.	Do.	39.27	10′ 30″	2.8050	91	$10\frac{3}{4}$	$19\frac{3}{4}$	$\frac{1}{264}$	$\frac{1}{485}$	Do.	Against the wind.
12.	Do.	Do.	Do.	Do.	Do.	Do.	39.27	$10\frac{3}{4}$	2.7300	98	$20\frac{3}{4}$	$29\frac{3}{4}$	$\frac{1}{470}$	$\frac{1}{680}$	Do.	
13.	Do.	Do.	Do.	Do.	Do.	Do.	39.27	9	3.2700	175	$20\frac{3}{4}$	$29\frac{3}{4}$	$\frac{1}{266}$	$\frac{1}{381}$	Do.	
14.	Do.	Two barges.	Do.	Do.	Do.	Do.	39.27	$10\frac{1}{2}$	2.8050	164	21	39	$\frac{1}{237}$	$\frac{1}{532}$	Do.	
15.	Do.	Do.	Do.	Do.	Do.	Do.	18.63	5′ 25″	2.5800	172	21	39	$\frac{1}{273}$	$\frac{1}{507}$	Do.	
16.	Do.	Do.	Do.	Do.	Do.	Do.	30.30	9′ 5″	2.50	196	42	60	$\frac{1}{480}$	$\frac{1}{689}$	Do.	[1]This experiment made by Mr. Bevan.
17.	Grand Junction.	Common boat.	. .	. .	. .	. .	10 miles	4° 5′	2.45	80	. .	31	. .	$\frac{1}{868}$	[1] Horses.	[2]Corrected for the effect of the wind, estimated at 8 lbs. The weight in both cases was 72 lbs., and the experiment was repeated with the barge turned about, merely for this comparison.
18.	Do.	Do.	Paddington.	45 wide 5 deep	69 feet	. .	10 chains.	2′ 7″	3.64	80	empty.	$6\frac{1}{2}$	. .	$\frac{1}{181}$	[2] Men.	
19.	Do.	Do.	Do.	Do.	Do.	Do.	10 „	4′ 35″	3.27	64	do.	do.	. .	$\frac{1}{328}$	Do.	
20.	Do.	Do.	Do.	Do	Do.	Do.	10 „	3′ 52″	3.87	308	$21\frac{1}{2}$	27	. .	$\frac{1}{203}$	Men and horses.	There was no wind when the last two experiments were made.
21.	Do.	Do.	Do.	Do.	Do.	Do.	10 „	6′ 8″	2.44	77	$21\frac{1}{2}$	27	. .	$\frac{1}{814}$	Men.	

The following are the particulars of the last four experiments, made on the Grand Junction Canal, at Paddington, by Messrs. Barlow, Chapman, Donkin, and Palmer.

EXPERIMENT I.—Empty barge; weight, 6½ tons; force employed, 72 lbs.; fraction of the force to the whole effect, $\frac{1}{205}$; wind in favor.

Number of Stakes.	Time.	Time between the Stakes.	Velocity per hour in miles.
1	0′ 29″	29″	3.104
2	1 7	28	3.214
3	1 34	27	3.333
4	2 0	26	3.461
5	2 24	24	3.750
6	2 49	25	3.600
7	3 13	24	3.750
8	3 39	26	3.461
9	4 3	24	3.750
10	4 28	25	3.660
11	4 54	25	3.600
12	5 15	22	4.090
13	5 41	26	3.461

EXPERIMENT II.—Empty barge; weight, 6½ tons; force employed, 72 lbs.; fraction of the force to the whole effect, $\frac{1}{205}$; against wind.

Number of Stakes.	Time.	Time between the Stakes.	Velocity per hour, in miles.
12	0′ 33″	33″	2.727
11	1 2	29	3.104
10	1 29	27	3.333
9	1 56	27	3.333
8	2 24	28	3.214
7	2 51	27	3.333
6	3 18	27	3.333
5	3 45	27	3.333
4	4 11	26	3.461
3	4 40	29	3.104
2	5 8	28	3.214
1	5 37	29	3·104

EXPERIMENT III.—Load, 21½ tons, which, added to 6½ tons, the weight of the barge, gives 28 tons, the whole effect; fraction of force to whole effect, $\frac{1}{203}$; force, 308 lbs.

Number of Stakes.	Time.	Time between the Stakes.	Velocity per hour, in miles.
1	′ 38″	38″	2.395
2	1 3	25	3.600
3	1 26½	23½	3.829
4	1 49½	23	3.918
5	2 12	22½	4.000
6	2 34½	22½	4.000
7	2 57½	23½	3.829
8	3 21	23½	3.829
9	3 44½	23½	3.829
10	4 9	24½	3.673
11	4 32	23	3.918
12	4 56	24	3.750
13	5 19	23	3.918

EXPERIMENT IV.—Load, 2½ tons + 6½ tons = 28 tons, the whole effect; force employed, 77 lbs.; fraction of force to whole effect, $\frac{1}{811}$.

Number of Stakes.	Time.	Time between the Stakes.	Velocity per hour, in miles.
1	1′ 6″	1′ 6″	1.363
2	1 54	48	1.875
3	2 34½	40	2.222
4	3 13	38½	2.337
5	3 49	36	2.500
6	4 25	36	2.500
7	5 1	36	2.500
8	5 37½	36½	2.465
9	6 15	37½	2.400
10	6 42½	37½	2.400
11	7 30	37½	2.400
12	8 6	36	2.500
13	8 42	36	2.500

TABLE OF THE DIMENSIONS OF THE BARGES USED ON THE GRAND JUNCTION CANAL.

Distance from the head of the barge.	Greatest width at the several distances.		Width inside at the several distances.		Depth below water.		Depth above water.		Girt at the several distances.	
					on the one side.	on the other.	on the one side.	on the other.		
Feet.	Feet.	In.	Feet.	In.	Inches.	Inches.	Inches.	Inches.	Feet.	In.
5	5	3½	1	10	...	...	35.3	36.0	10	3½
10	6	6	4	2	9.2	8.5	32.9	33.1	11	10½
15	6	8½	5	7	...	...	31.5	32.2	13	0
20	6	7¾	5	11	9.6	8.4	31.5	32.3	13	1½
25	6	8	6	0	...	...	31.4	31.9	13	2
30	6	9	6	0	...	...	31.1	31.4	13	2
35	6	8¼	6	0	...	...	30.0	31.4	13	2
40	6	8	6	0	9.8	8.9	31.1	31.7	13	2
45	6	7½	6	0	.1	...	31.0	31.8	13	2½
50	6	8	5	11	11.1	9.3	30.9	31.4	13	2¼
55	6	9	5	1	...	...	31.4	31.8	12	9
60	...		4	2	9.7	9.0	32.9	33.1	11	3
65	...		1	10	...	..	36.8	37.3	9	7

69 feet the whole length, not including the rudder.

The weights with which the barges were loaded were those used for determining the gauge marks on the part of the Company.

The experiments on the Mersey and Irwell canal were made upon vessels that happened to arrive at the time without preference. The first was upon the packet which is used to convey passengers between Manchester and Runcorn, and is usually towed at the rate of 5¼ miles per hour.

Nos. 5, 6, 7, and 8 were made on the Ellesmere canal, with a boat built for the purpose, and which was of the same length as those commonly used, but exactly half their width

Nos. 9, 10, 11, 12, and 13. were made with one of the ordinary canal barges.

Nos. 14, 15, and 16, were made with two boats joined together end to end, and the curves, to the head of one and the stern of the other, so planked over as to form one boat of double the ordinary length.

No. 17, having been made by Mr Bevan, I have no other information relating to it than the facts as given in the table.

Nos. 18, 19, 20, and 21, were tried under circumstances as favorable as are usually met with; the effect of the wind was, however, very apparent.

Every variation in the resistance through all the experiments was easily discernible when it amounted to six ounces, and sometimes less.

In conclusion, I think it necessary to remark, that in such experiments as these which have been described, the action of the wind, whether in favor or opposed to the motion of the vessel, should receive the nicest attention. The difficulty does not consist only in ascertaining the amount of the atmospheric action at any given time, but in making a due allowance for its variations during the time of one experiment: still weather should be chosen for the purpose, and the experiments should be made early in the morning, before any sensible wind has arisen.

The above experiments were submitted to Peter Barlow, Esq., F. R. S., and the following are the deductions he made from them.

Report of Peter Barlow, Esq., F. R. S., on the Experiments of Henry R. Palmer, on the resistance of Barges on Canals, etc.

In order to reduce the law of resistances from the foregoing experiments, it is requisite that the comparison should be made between those on the same boat and under the same circumstances; for the resistance opposed to different boats will depend on their transverse sections, their draught of water, the section of the canal, and various other circumstances, which will prevent the deduction of any general law applicable to all cases.

Mr. Palmer states that the first four experiments on the Ellesmere canal, with a

small boat, were made under particularly favorable circumstances of weather, &c. These therefore may be employed for deducing the law of the resistances, as it depends on velocity.

It is generally assumed, on the common theory of fluids, that the resistance varies as the square of the velocity, but it has been found that this law does not obtain in practice, and different experimenters have obtained different results, varying from the 2d to the $\frac{5}{2}$ power of the velocity. It will appear, however, from the following investigations, that in the case of loaded canal boats, it varies in a still higher ratio, viz., as the cube of the velocity very nearly, if not exactly. In order to make this comparison, it is only necessary to proceed as below, by saying,

$$V^m : v^m :: F : f.$$

using for V, v, F, f, the actual velocity and moving powers employed.

From this proportion is very easily obtained the theorem $m = \dfrac{\log F - \log f}{\log V - \log v}$; and employing in this the velocities and forces given in the first four experiments, there is obtained the following results, comparing the experiment

1 to 3 . . . . $m = 3.2$
1 to 4 . . . . $m = 2.7$
2 to 3 . . . . $m = 3.0$
2 to 4 . . . . $m = 2.6$

Mean value of $m = 2.9$ or 3 nearly.

By comparing experiments 7 and 8, which are made under like circumstances and on the same boat, we find $m = 3.2$, and in the same way experiments 17 and 18 give nearly the same result, viz., $m = 3.0$, the general mean being $m = 3.0$

It is clear, therefore, that, whatever may be the deduction from theory, the actual resistance of canal boats varies very nearly as the cubes of the velocities; and, by adopting this law, the velocities due to any force and load may be computed from the velocity and resistance in any other case being given.

And as it will be seen by the experiments on the different railways, that at a mean, one lb. will draw along 180 lbs., and that a power of 1 to 200 is the greatest that the most perfect railway can ever be expected to attain; I have computed what velocity is attainable on a canal answering to those two cases, viz., when the moving force is $\frac{1}{180}$th part of the whole load moved. These results are given in the following table, omitting those made on empty boats and sea-going barges.

Navigation, description of the barges, etc,	Authority.	Whole load including barge.	Moving force.	No. of lbs. drawn by 1 lb.	Rate in miles per hour	Computed rate when 1lb draws 180 lbs.	Computed rate when 1lb draws 200 lbs.	REMARKS.
		Tons.	lbs.					
Ellesmere boats, half the usual breadth; length 69 feet; breadth 3 feet 6 inches.	Palmer.	$14\frac{1}{2}$	168	193	4.60	4.70	4.54	
		$14\frac{1}{2}$	170	191	4.69	4.78	4.62	
		15	77	436	3.63	4.97	4.70	
		15	5[illegible]	672	2.96	4.59	4.43	
Common boat.	Do.	30	50	1344	1.90	3.71	3·58	
Common boat, half load.	Do.	$19\frac{3}{4}$	79	500	2.94	4.29	4.12	The moving weights were 66 lbs. and 91 lbs; they are corrected for the effect of the wind.
		$19\frac{3}{4}$	78	567	2.80	4.10	3.96	
Common boat, full load.	Do.	$29\frac{3}{4}$	98	680	2.73	4.25	4.09	
		$29\frac{3}{4}$	175	381	3.27	4.19	4.05	
Two common boats, end to end.	Do.	39	164	532	2.80	4.01	3.87	
		39	17[illegible]	507	2.58	3.64	3.51	
Do full load.	Do.	60	19[illegible]	689	2.50	3·91	3.75	
Common boat.	Bevan.	31	8[illegible]	863	2.45	4.13	4.08	
Common boat, full load.	Barlow, Donkin, &c.	27	308	203	3.87	4.02	3.88	
		27	77	814	2.44	4.04	3.90	
					Mean	4.22	4.06	

It is clear, therefore, that on a canal, when the moving power is $\frac{1}{200}$th of the whole load, including the barge, it may be taken forward at the rate of 4 miles per hour, and that when the force is $\frac{1}{180}$th, the rate of transfer will be $4\frac{1}{2}$ miles per hour. It is easy also, from what has now been stated, to compute the power on a canal, at different velocities: for example,

At 4 miles per hour, 1 lb. will draw	200 lbs.
$3\frac{3}{4}$	243
$3\frac{1}{2}$	299
$3\frac{1}{4}$	373
3	474
$2\frac{3}{4}$	615
$2\frac{1}{2}$	819
$2\frac{1}{4}$	1124
2	1600

ON THE PROCESS OF CARBONIZATION, OR MANUFACTURE OF CHARCOAL, AT GOERSDORF, IN SAXONY.

It having been suggested by M. Boult that a superior charcoal might be produced by filling the interstices of the pile with small charcoal, the refuse of former burnings, an experiment was made, which, after being several times repeated, gave the following results: 1st, an increase of produce, amounting to not less than four per cent. above that yielded by the ordinary process; 2nd, a much smaller quantity of dust and small coal, 3rd, scarcely any smoke; 4th, charcoal of a very equal and superior quality.

A pile prepared for carbonization at Goersdorf contained in general about thirty *schragen*, (318 cubic yards) of pine trees split in quarters, which yielded, including the small coal, from eighty-nine to ninty-two per cent. in bulk of charcoal. It was considered desirable to ascertain, whether by increasing the size of the pile, a more considerable product would be obtained.—A pile containing forty-nine schragen (520 cubic yards,) of cleft pine wood, gave in an experiment, during which the weather proved favorable, 89.94 per cent. of charcoal (including the small,) very sonorous, and of very good quality. A second trial of $69\frac{1}{2}$ schragen (740 cubic yards,) of similar wood produced only 87.98 per cent. but the weather in this instance was unfavorable.

This experiment was repeated with seventy-one schragen (750 cubic yards,) the weather continuing fine throughout the process; the produce amounted to 94.87 per cent.; equal in quality to the former results. The average results of the adoption of this process at Goersdorf, will appear from the following table of the produce, from the commencement to the date of the latest improvements.

	Produce per cent.		Total produce per cent.
	Large.	Small.	
1821. . .	74.34	3.91	78.85
1822. . .	76 24	4.76	81.—
1823. . .	76.44	5.25	81.69
1824. . .	77.95	4.09	82 04
1825. . .	86.31	4.35	90.66
1826. . .	86.31	3·62	89.93
1827. . .	87.53	4.20	91.73

The increase observable in the produce of 1825, is to be attributed, principally to the care with which the operations were conducted, but it must be also remarked, that the removal of the pipe for collecting the acid formed in the process of carbonisation, may also have contributed beneficially to the results. M. Karsten in his *Voyage Metallurgique* states, that in Carinthia, the carbonization of pine wood is performed in large stacks, containing 20,000 cubic feet, and without the trees being previously split, yet the produce in bulk is computed at from seventy-one to eighty-six per cent. It is obvious, that there exists no analogy between these results and those obtained from the brushwood and billets of oak, beach, &c., by the common process of carbonization, which seldom yields more than from thirty-five to forty-five per cent.; it is, therefore, only necessary to call public attention to the fact, and it may naturally be expected that, in the present state of practical science, a subject of so much importance in metallurgy will be duly investigated.—[Lond. Quar. Mining Review.]

INFERIORITY OF ENGLISH TO CHINA INK.—The directors of the Bengal bank lately refused payment for a number of bank notes, in consequence of their containing no signature. It appeared that they belonged to a Hindoo, who had kept them in a copper box. He asserted that they originally possessed the signatures of the di-

rector, comptroller, cashier, &c., but that they had been effaced. The notes on which the signatures had been written with China ink remained uneffaced, but all the writing with English ink had completely disappeared. Mr. Princep, in order to determine the question, placed a paper covered with writing in English ink between two plates of copper. After a short space of time he found that the copper had decomposed the ink, and that the writing was completely effaced. He concluded that the account of the Hindoo was correct, and that the bank ought not to refuse payment.*—[Rec. Gen. Science.]

* Asiat. Society Journal, and L'Institut, 182, 368.

Analysis of Iron Ores.—Berzelius states the following to be a rapid mode of analysing these ores. He boils them with chloride of copper slightly acidulated with muriatic acid, then on boiling the residue with carbonate of soda, washing the result, drying and weighing, its weight indicates that of the barbon.*—[Rec. Gen. Science.]

* L'Institut, 170.

From the London Mechanics' Magazine.

TUNNELS.

REPORT ON THE PRIMROSE-HILL TUNNEL ON THE LONDON AND BIRMINGHAM RAILWAY, BY JOHN PARIS, M. D., THOMAS WATSON, M. D., CANTAB., WM. LAWRENCE, ESQ., AND R. PHILLIPS, ESQ.

We, the undersigned, visited together, on the 20th February, 1837, the Tunnel now in progress under Primrose-hill, with the view of ascertaining the probable efiect of such Tunnels upon the health and feelings of those who may traverse them.

The Tunnel is carried through clay, and is lined with brickwork. Its dimensions, as described to us, are as follows: height 22 feet, width 22 feet, length 3,750 feet. It is ventilated by five shafts, from 6 to 8 feet in diameter, their depth being 35 to 55 feet.

The experiment was made under unfavorable circumstances. The western extremity of the Tunnel being only partially open, the ventilation is less perfect than it will be when the work is completed. The steam of the locomotive engine also was suffered to escape for twenty minutes, while the carriages were stationary near the end of the Tunnel; even during our stay near the unfinished end of the Tunnel, where the engine remained stationary, although the cloud caused by the steam was visible near the roof, the air for many feet above our heads remained clear, and apparently unaffected by steam or effluvia of any kind; neither was there any damp or cold perceptible.

We found the atmosphere of the Tunnel dry, and of an agreeable temperature, and free from smell or perceptible effluvia of any kind; the lamps of the carriages were lighted; and, in our transit inwards and back again to the mouth of the Tunnel, the sensation experienced was precisely that of travelling in a coach by night, between the walls of a narrow street. The noise did not prevent easy conversation, nor appear to be much greater in the Tunnel than in the open air.

Judging from this experiment, and knowing the ease and certainty with which thorough ventilation may be effected, we are decidedly of opinion that the dangers incurred in passing through well-constructed Tunnels are no greater than those incurred in ordinary travelling upon an open railway or upon a turnpike-road; and that the apprehensions which have been expressed that such Tunnels are likely to prove detrimental to the health, or inconvenient to the feelings of those who may go through them, are perfectly futile and groundless.

John Paris, M. D.
Thomas Watson, M. D., Cantab.,
Physician to the Middlesex Hospital, and Professor of Medicine at King's College.
Wm. Lawrence,
Surgeon of St. Bartholomew's Hospital.
Rd. Phillips,
Lecturer on Chemistry at St. Thomas's Hospital.
London, Feb. 21, 1837.

The First Russian Railway.—The locomotive carriages made in England for the Pawlosk Railways, do not appear to have answered *quite* so well at the place of their destination, as they are said to have done on experimentai trips in the land of their birth. On the 22nd December last, some short journeys were performed on that part of the line already completed, for the express pur-

pose of demonstrating the practicability of Railway travelling in the very depth of a Russian winter. On this occasion, the velocity did not much exceed twenty miles an hour: a very satisfactory pace, especially under the circumstances, but still something under the "seventy-five miles an hour" rate *reported* to have been attained in England: on another day, the result was not even equal to this, which is attributed to the wind's blowing against the line of direction; perhaps, therefore, it blew the right way on the experimental trips, under the direction of the builder. On the 22nd December, the apparatus for removing the snow from before the wheels was tried, and proved quite successful; from recent experience at home, it would appear that any apparatus for that special purpose is quite unnecessary.

CONSUMPTION OF COAL IN GREAT BRITAIN.—The quantity of iron annually produced in Great Britain may be taken at 700,000 tons; and the quantity of coal required, at an average, to produce each ton of iron, including that used by engines, &c. may be estimated at $5\frac{1}{2}$ tons; giving a total of 3,850,000 tons consumed in the making of iron. According to Mr. Kennedy, the quantity of coal consumed in the cotton manufacture, in 1817, was upwards of 500,000 tons, and the manufacture has since more than doubled; so that, allowing for greater economy, we may fairly estimate the consumption of coal in the cotton trade at 800,000 tons a year. Its consumption in the woollen, linen, and silk trades cannot be less than 500,000 tons. The smelting of the copper ores of Cornwall consume annually about 250,000 or 300,000 tons; and it is supposed that the brass and copper manufactures require nearly as much. In the salt-works of Cheshire, Worcestershire, &c. the consumption is probably not under, if it do not exceed, 300,000 tons. The consumption in lime works may, it is believed, be estimated at 500,000 tons. It would appear, therefore, that the total annual consumption of coal in Great Britain may be moderately estimated as follows:—

	Tons.
Domestic consumption, and smaller manufactures	15,000,000
Production of pig and bar iron	3,850,000
Cotton manufacture	800,000
Woollen, linen, silk, &c.	500,000
Copper smelting, brass manufactures, &c.	450,000
Salt-works	300,000
Lime-works	500,000
	21,350,000
Exports to Ireland	750,000
Ditto to colonies and foreign parts	600,000
Total	22.700.000

If we suppose that the above sum of 22,700,000 tons costs the consumer, on an average, 7*s.* a ton, it will be worth, in all, 7,955,000*l.* a year!—[M'Culloch's Account of the British Empire.]

From the R. R. Journal.

MACHINERY FOR PREPARING RAILROAD TIMBER.

We give publicity to the following communication, as the best mode of answering the desire of the writer.

PEMBROOKE, Genesee Co.,
April 27, 1837.

Messrs. Minor & Schaeffer.

Gentlemen—On perusing the Journal of 24th December last, I found some remarks of William Dewey, Esq., in his Report upon the Watertown and Cape Vincent Railroad, which drew my attention to the subject of Machinery for preparing timber for the foundation of Railroads.

Having some knowledge of Mechanics as also of Engineering, I turned my attention to the subject during the past winter, and have constructed a model. The design of which is to be attached to a Locomotive, and placed on a section of the road finished for that purpose. A travel of 55 rods will transport, cut and prepare two sills, and four ties to be delivered to the workmen at the end of the track. And as the track is extended will prepare a large load of timber. The sills are straitened on one side, or split in the centre. Ties split or quartered as may be desired, and rails and ribing sawed of any size required.

The machine is extremely simple not

likely to get out of repair. Requires but two hands to manage it, and may prepare a load of timber without stoping to shift the Logs. The cost of Machine will probably fall below $500.

I take the liberty of addressing you, gentleman, for the reason that I suppose it something likely that Mr. Dewey may not be in the city. You will oblige me therefore by communicating these lines to him, and as I am about to construct a full size machine under the patronage of the Buffalo and Batavia Railroad association. Mr. Dewey would oblige me much by giving it a personal examination when finished.

A communication from Mr. Dewey, would also be very acceptable.

Very respectfully,

Your obedient servant,

AMOS TYRELL, JR.

OCEAN STEAM NAVIGATION.

An article in the London Nautical Magazine, for March, furnishes the following notice of preparations which are making in England, in reference to the establishment of regular steam packet communications between that country and the United States. The boats, it will be seen, are to be of extraordinary dimensions, with machinery of corresponding power.

There are two vessels at present building to run direct from Bristol and London to New-York. The great Western Saip Company's vessel is building at Bristol, and is of the following dimensions and power:

Length between Perpendiculars,	316 ft.
Beam,	35 "
Depth in hold,	22 "

The engines are 400 horse power, having cylinders 73 inches diameter, and 7 feet stroke.

This noble vessel is expected to be ready in the course of the approaching summer, and will most probably make her first voyage in August next. She is intended to carry twenty-five days' fuel—a quantity quite sufficient to ensure the regular performance of the voyage in all weathers.

The British and American steam navigation company, whose head quarters are in London, have contracted with Messrs. Curling, Young & Co. of Limehouse, for a vessel of 1,795 tons, builders' measurement, and of the following dimensions and power:

Length between Perpendiculars,	335 ft.
Beam,	40 "
Depth.	27 "

to have engines of 460 horse power, having cylinders 76 inches in diameter, and 7 feet stroke. The engines are fitted to work either with or without Hall's condenser, at the option of the engineer. This magnificent vessel, the largest steam vessel ever yet propelled, will have capacity for twenty-five days' fuel, 800 tons of measurement goods, and 500 passengers.

We sincerely wish both the Bristol vessel and the London one all manner of success; and when we reflect on the immense intercourse between this country, the United States and Canada—sixty thousand people having landed at New-York from the 1st January to 1st September, and twenty-seven in Quebec last year—the increase that will naturally take place when the passage is shortened at 15 days, instead of 37, the present outward average passage of the New-York packet ships, we do not think that any, out of the numerous plans before the public, hold out stronger inducement to the capitalist than such undertakings

It is difficult to estimate the national benefit that will accrue to both countries by the establishment of steam communication between them—the one with an overflowing population, the other with inexhaustible reserves of fertile lands—the one the greatest manufacturing, the other the most extensive producing country, in the world—both talking the same language, and allied by blood, religion, and feeling, with one another. Thus much, we may affirm, that it will greatly improve both countries, and render perpetual the peace that now so happily exists between them.

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